

determining an undocked operation of the drive module to both counteract the deviation of the body from the body equilibrium state and maintain the mobile drive unit in motion along the first travel path; and

controlling the drive module so as to perform the undocked operation;

control a lifting system of the mobile drive unit to lift an inventory holder relative to the mobile drive unit so that the inventory holder is carried by the mobile drive unit; and

control the drive module of the mobile drive unit so as to move the mobile drive unit with the inventory holder carried by the mobile drive unit along a second travel path by iteratively:

receiving information about a payload comprising the inventory holder carried by the mobile drive unit;

determining, based on the information about the payload, a deviation of the payload from a payload equilibrium state in which moments acting on the payload are balanced;

determining a docked operation of the drive module to both counteract the deviation of the payload from the payload equilibrium state and maintain the mobile drive unit in motion along the second travel path; and controlling the drive module so as to perform the docked operation.

17. The control module of claim **16**, wherein the control module is configured to control the lifting system of the mobile drive unit to lift the inventory holder relative to the mobile drive unit so that the inventory holder is carried by the mobile drive unit by iteratively:

receiving information about a center of gravity of the inventory holder;

determining, based on the information about the center of gravity of the inventory holder, a deviation of the center of gravity of the inventory holder from an inventory

holder equilibrium state in which moments acting on the center of gravity of the inventory holder are balanced;

determining an adjusting operation of the drive module to counteract the deviation of the center of gravity of the inventory holder from the inventory holder equilibrium state;

controlling the drive module so as to perform the adjusting operation; and

controlling the lifting system to lift the inventory holder an incremental amount.

18. The control module of claim **17**, wherein the control module is further configured to control the lifting system so as to undock from the inventory holder and re-dock with the inventory holder in a different alignment in response to information received about the center of gravity of the inventory holder.

19. The control module of claim **16**, wherein the control module is further configured to deploy a kickstand so as to at least one of:

stabilize the mobile drive unit prior to or during a lifting operation;

move a bottom portion of the mobile drive unit away from a support surface on which the mobile drive unit travels to a position in which the drive module is capable of performing operations for counteracting deviations from equilibrium states; or

prevent a bottom portion of the mobile drive unit from dropping to a position relative to the support surface in which the drive module is incapable of performing operations for counteracting deviations from equilibrium states

20. The control module of claim **19**, wherein the control module is further configured to retract the kickstand.

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